TIMBER TECHNOLOGY BULLETIN

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Timber Notes - Heavy Hardwoods II (Kekatong, Keranji, Merbau, Penaga, Resak)

by

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Trade name: Kekatong

Species: *Cynometra iripa* (kekatong laut), *C. malaccensis* (kekatong, katong-katong, belangan), *C. ramiflora* (kekatong laut), *C. cauliflora* (nam-nam).

1. Tree type and distribution: Three wild species and occasionally cultivated (*C. cauliflora*). Found throughout lowland forests. Mainly coastal but also inland (*C. iripa*), lowlands and hills up to 610 m (*C. malaccensis*), river banks and swamps, especially near the coast (*C. ramiflora*).

2. Wood characteristics: Heartwood dark red. Sapwood lighter coloured and not well defined. Corewood brown-black or chocolate. Surface not lustrous. Texture moderately fine and even. Grain spiral or shallowly interlocked.

3. Timber classification: HHW

4. Wood density: Ranges from 880 to 1155 kg m^{-3} air dry.

5. Drying and relative movement: Air drying of 15 mm and 40 mm boards takes approximately 3 months and 5 months respectively. For kiln drying, schedule B is recommended.

6. Machining properties: Difficult to resaw and cross-cut. Planing is easy to slightly difficult and planed surfaces is moderately smooth. Poor nailing property.

7. Durability: Moderately durable. Very difficult to treat.

8. Strength grouping: A

9. Strength properties: Values based on tests carried out on *Cynometra malaccensis*.

Property (MPa)	Green	Air dry
Modulus of rupture	105	135
Modulus of elasticity	17 000	18 400
Maximum crushing strength	56.0	67.0

10. Uses: Suitable for heavy and medium duty construction under cover, flooring and railway sleeper when treated.

Trade name: Keranji

Species: *Dialium cochinchinense* (keranji kertas kecil), *D. indum* (keranji kertas besar), *D. kingii* (keranji bulu), *D. kunstleri*, *D. laurinum* (keranji tebal besar), *D. maingayi* (keranji tebal kecil), *D. marginatum, D. patens* (keranji paya), *D. platysepalum* (keranji kuning besar), *D. procerum* (keranji tunggal), *D. wallichii* (keranji kuning kecil).

1. Tree type and distribution: Found scattered throughout the lowlands and hills. One species, *D. patens*, is found growing in swamps. The trees are slender and commonly reach a height of 36 m and girth of 2.4 m.

2. Wood characteristics: Heartwood golden brown or red-brown. Sapwood white to yellowish and distinct. Texture fine to moderately coarse and even. Grain interlocked or wavy.

3. Timber classification: HHW

4. Wood density: Ranges from 755 to 1250 kg m^{-3} air dry.

5. Drying and relative movement: Air drying of 15 mm and 40 mm boards takes approximately 2 months and 6 months respectively. For kiln drying, schedule E is recommended. Type II movement.

6. Machining properties: Easy to very difficult to resaw and cross-cut depending on species. Planing is easy to slightly difficult and the planed surface is moderately smooth. Nailing property is good.

7. Durability: Moderately durable. Sapwood is susceptible to insect and fungal attack. Difficult to treat.

8. Strength grouping: A

9. Strength properties: Values base on tests carried out on *Dialium platysepalum*

Property (MPa)	Green	Air dry
Modulus of rupture	109	134
Modulus of elasticity	18 800	20 100
Maximum crushing strength	54.5	72.0

10. Uses: Suitable for heavy construction, flooring, handle for striking tool and baton.

Trade name: Merbau

Species: *Intsia palembanica* (merbau), *I. bijuga* (merbau ipil).

1. Tree type and distribution: *Intsia palembanica* is tall and capable of achieving more than 50 m height and 4 m girth. It is the main source of merbau timber in the trade. *Intsia bijuga* rarely achieves timber size and is commercially unimportant. The trees occur throughout Peninsular Malaysia, mainly in low-lying areas and along rivers.

2. Wood characteristics: Heartwood brown to dark red-brown. Sapwood white or pale yellow and well defined. Texture coarse but even. Grain interlocked or wavy.

3. Timber classification: HHW

4. Wood density: Ranges from 515 to 1040 kg m^{-3} air dry.

5. Drying and relative movement: Air drying of 15 and 40 mm boards takes approximately $4^{1/2}$ months and 6 months respectively. For kiln drying, schedule D (tentative) can be used. Type III movement.

6. Machining properties: Moderately easy to resaw and cross-cut when green but slightly difficult when dry. Planing is easy to slightly difficult and planed surface is smooth. Poor nailing property.

7. Durability: Heartwood is durable and resistant to termite attack. Sapwood is perishable. Timber very difficult to treat.

8. Strength grouping: B

9. Strength properties: Values based on *Intsia palembanica*.

Property (MPa)	Green	Air dry
Modulus of rupture	89	116
Modulus of elasticity	13 900	15 400
Maximum crushing strength	46.7	58.2

10.Uses: Suitable for interior finishing, panelling, strip and parquet flooring, furniture, veneer, decorative and novelty items.

Trade Name: Penaga

Species: *Mesua ferrea* (family Guttiferae).

1. Tree type and distribution: Medium-sized trees up to 24 m tall, 210 cm girth. Bole fluted at butt and sometimes upwards. Distributed throughout Peninsular Malaysia, apparently rare from Negri Sembilan southwards. Common and often gregarious on thin-soiled, excessively drained ridges to 480 m.

2. Wood characteristics: Very hard and heavy timber. Heartwood red-brown with a purple tinge and sapwood pale yellow. Texture fine and even. Grain interlocked and spiral.

3. Timber classification: HHW

4. Wood density: Ranges from 945 to 1185 kg m^{-3} air dry.

5. Drying and relative movement: Air drying of 15 mm and 40 mm boards takes 7 and 8 months respectively. Use of end-coating is strongly recommended to reduce incidences of end checks and splits. Type IV movement.

6. Machining properties: Slightly difficult to difficult to resaw and cross-cut but easy to plane. Planed surface produced is smooth. Nailing property is rated poor.

7. Durability: Moderately durable. Liable to be attacked by termites.

8. Strength grouping: A

9. Strength properties: Based on tests carried out on *Mesua ferrea*.

Property (MPa)	Green	Air dry
Modulus of rupture	118	155
Modulus of elasticity	17 000	19 500
Maximum crushing strength	63.2	79.5

10. Uses: Suitable for all forms of heavy construction, heavy duty furniture, parquet flooring, post and tool handle.

Trade name: Resak

Species: Comprises 2 species of the genus *Cotylelobium* and 21 species of the genus *Vatica* of the family Dipterocarpaceae.

1. Tree type and distribution: *Cotylelobium* is found in low coastal hills and sandy ridges at the mouths of rivers along the eastern coasts of Trengganu, Pahang and Johore. *Vatica* is found throughout the dipterocarp forests particularly in the hills and ridge tops with the exception of the deeper coastal peat swamps.

2. Wood characteristics: Heartwood yellow-brown with an olive tinge darkening to a dark red-brown. Sapwood light yellow-brown and well defined. Texture fine and even. Grain interlocked.

3. Timber classification: HHW

4. Wood density: Ranges from 655 to 1155 kg m^{-3} air dry

5. Drying and relative movement: Air drying of 15 mm and 40 mm boards takes 3 months and 5 months respectively. Type IV movement.

6. Machining properties: Difficult to resaw and cross-cut with *Vatica*, while *Cotylelobium* is moderately easy to slightly difficult to resaw. Planing is easy to slightly difficult and the finished surface is smooth.

7. Durability: Very durable. Timber very difficult to treat.

8. Strength grouping: B

9. Strength properties: Values based on minimum average test values carried out on *Vatica stapfiana* and *Vatica cuspidata*.

Property (MPa)	Green	Air dry
Modulus of rupture	81	-
Modulus of elasticity	14 400	-
Maximum crushing strength	41.7	-

10.Uses: Suitable for all forms of heavy constructions, flooring, railway sleeper and wooden container. The lighter varieties are suitable for cabinet works, high grade joinery, interior fitting and sliced veneer.

Kekatong

Keranji

Merbau

Penaga

Resak

BACKGROUND INFORMATION

1. Tree type and distribution

The distribution and size of tree are given.

2. Wood characteristics

The colours of sapwood and heartwood, figure, appearance on planed surface and any other characteristic features of the timber.

3.Timber classification

Under the Malaysian Grading Rules (1984), timbers are classified as Heavy Hardwood (HHW) when their density exceeds 800 kg m^{-3} and the timbers are naturally durable. Medium Hardwoods (MHW) are timbers with density 720 - 800 kg m^{-3} but lack sufficient natural durability. Light Hardwoods (LHW) are timbers with density below 720 kg $m^{-3}$and are not naturally durable in exposed condition.

4. Wood density

Green density of freshly sawn board, defined as green mass divided by green volume. It varies with the freshness of the log in the log yard before processing and seasoning. Air dry density is the average mass divided by volume at 15 per cent moisture content.

5. Drying and relative movement

Air drying time for 15 mm and 40 mm boards and moisture content are from Grewal (1979). "Air-seasoning Properties of Some Malaysian Timbers", Timber Trade Leafet No. 41. Suitable kiln drying schedule is mentioned [schedules based on Grewal (1988), "Kiln Drying Characteristic of Some Malaysian Timbers", Timber Trade Leaflet No. 42]. The relative movement (whenever is available) is defined as the change in dimension of a piece of timber when exposed to the service conditions of 60 % RH/30 ^{0}C and 95 % RH/30 ^{0}C respectively, and expressed as percentage of the value at 60 % RH/30 ^{0}C. The movement ratings stated are based on values of the corresponding tangential movement [Choo *et al*. (1998), "Movement of Seasoned Timber in Service", FRIM Technical Information Handbook No. 18].

Movement rating	Tangential movement (%)
Type I	< 1.5
Type II	1.5-2.0
Type III	2.1-2.5
Type IV	2.6-3.0
Type V	> 3.1

6. Machining properties

Comments are made on the comparative ease or difficulty of sawing, planing, turning, boring, peeling, gluing and other wood working properties.

7. Durability

Durability ratings of Malaysian Timbers are based on performance of test-stacks in graveyard testing. Test-stacks of 50 x 50 x 600 mm are buried in test grounds and their performance monitored. The number of years that the timber can last under such condition is used to classify the durability of the timber. Under the system, timbers are classified as follows:

Rating	Number of years
Very durable	more than 10
Durable	5-10
Moderately durable	2-5
Non-durable	0-2

Susceptibility to fungal, termite attacks and treatability may be mentioned.

8. Strength grouping

In the strength grouping of timber under each trade name, ranking is allocated from A (strongest) to D (weakest). Minimum values for strength groups are based on common grade for dry timber (below 19 % moisture content) (units are in MPa).

Strength group	A	B	C	D
Modulus of elasticity	9700	6600	5500	3100
Bending and tension parallel to grain	12.41	9.65	7.24	4.83
Compression parallel to grain	11.03	7.93	5.51	4.14
Compression perpendicular to grain	1.45	0.90	0.55	0.45
Shear parallel to grain	1.45	0.90	0.62	0.62

9. Strength properties

Values are from Lee *et al*. 1979, "The Strength Properties of Some Malaysian Timbers", Malaysian Forest Service Trade Leaflet No. 34.

10. Uses

Various past and potential uses are given, but the list is obviously not exhaustive.